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(56) Documents Cited:
FR 002937884 A1 **FR 002797189 A1**
US 20090159719 A1 **US 20070247555 A1**
US 20040261790 A1

(58) Field of Search:
INT CL **A01M, A61L, A61M**
Other: **WPI, EPODOC**

(54) Title of the Invention: **Volatile liquid emanation device**
Abstract Title: **Passive emanation device**

(57) A passive emanation device 1 emanates a volatile liquid 5 containing one or more active materials, wherein the active material comprises at least one of: a fragrance, insecticide, fungicide, pesticide, sanitising material and/or pharmaceutical. The passive emanation device comprises a housing 2, a volatile liquid reservoir 4, one or more capillary tubes 7 in non-valved fluid communication with the reservoir at one end thereof, a nozzle 8 located at the end ofeach capillary tube(s) remote from the reservoir wherein each nozzle is in non-valved fluid communication with each capillary tube(s); and an emanation substrate 6, wherein the housing is arranged to support the reservoir, capillary tube(s) and nozzle in spatial arrangement over the emanation substrate. The emanation substrate can be made from any natural or synthetic material that is capable of at least partially absorbing the volatile liquid. A method of providing a flow rate of volatile liquid between 0.1-500 mL/hr onto the emanation substrate is also claimed.

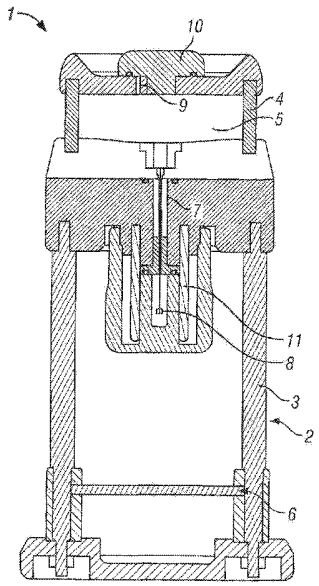

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 2007.

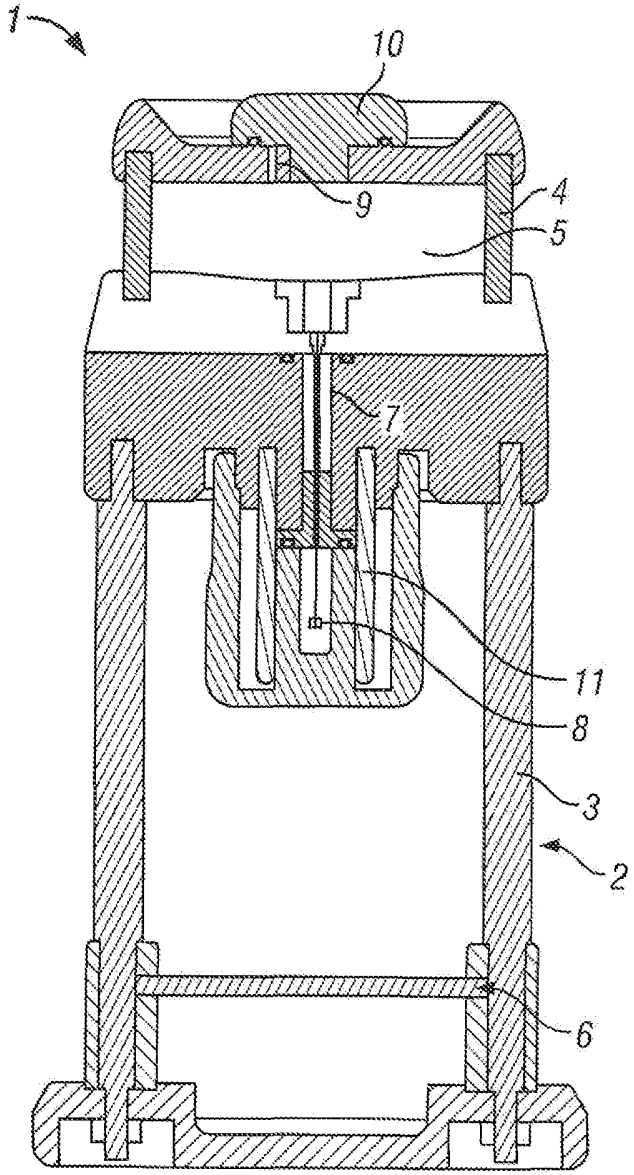

FIG. 1

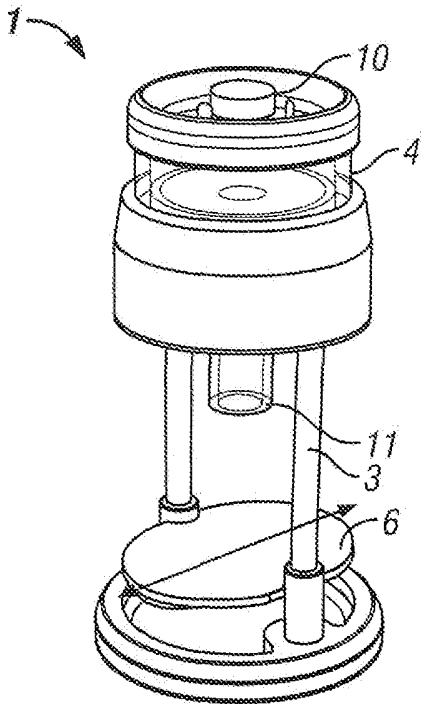

FIG. 2

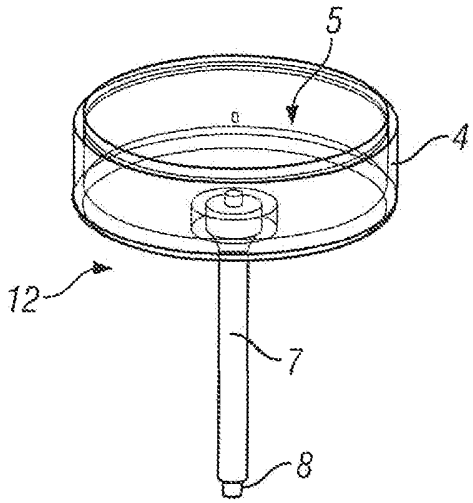

FIG. 3

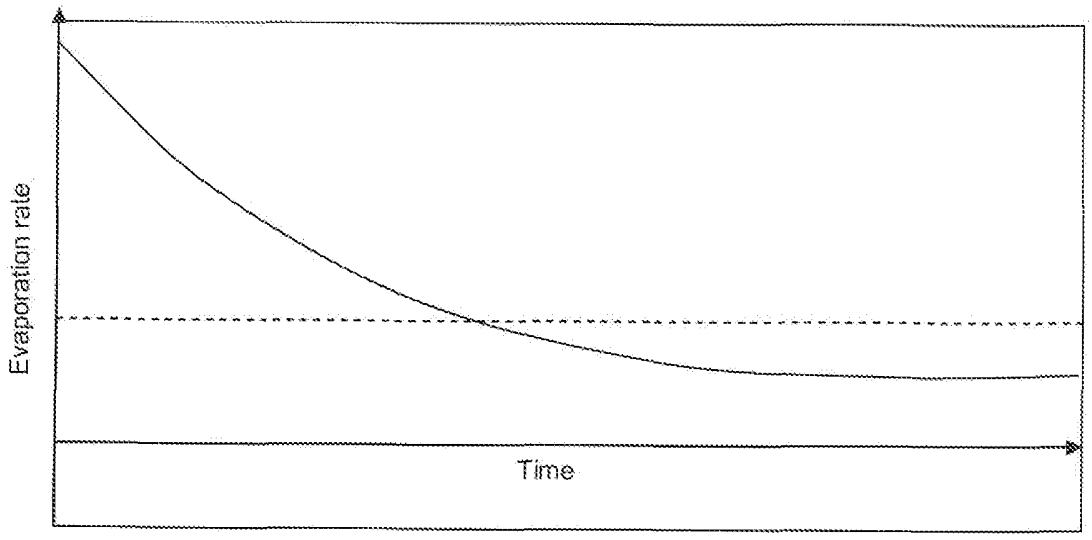

Fig. 4

Volatile Liquid Emanation Device

Field of the Invention

The present invention relates to a volatile liquid emanation device wherein said volatile liquids comprise active components such as fragrances, insecticides, fungicides, pesticides, sanitizing materials and pharmaceuticals are provided, and particularly the present invention relates to a passive, non-powered volatile liquid emanation device.

Background

Conventional passive emanation devices for volatile liquids typically work by exposing a one side of a permeable membrane to a reservoir of the volatile liquid. In such membrane-containing emanation devices, the membrane is in constant contact on one side thereof with the liquid and exposed to the external environment on its other side. The contact between the volatile liquid and membrane causes the membrane to uptake the liquid by capillary action and/or diffusion, thus permitting the emanation of the liquid by evaporation from its surface exposed to the environment. Whilst such devices are simple to construct they contain several drawbacks, some of which are identified below.

One drawback, particularly with the emanation of air fresheners is that of a phenomenon called "habituation". Habituation is when users of a continuously emanating air freshener get so used to the fragrance of the air freshener that they become unable to notice it after a period of time. This is problematic in particular with non-automated air freshening devices where the user is given no visual clues as to whether the device is emanating a fragrance or not.

A further drawback associated with devices having a membrane in constant contact with a volatile material, such as a volatile liquid air freshener, is the phenomena of vacuum build-up. The vacuum build-up phenomena can occur inside the housing due to the wetted membrane being unable to allow sufficient flow of air therethrough in order to equalise the drop in pressure inside the housing caused by the emanation of the volatile material. This build-up phenomena can cause unacceptable performance problems with such a device from a consumer perspective.

In the field of air freshening it is generally preferred to use a volatile liquid fragrance/air freshener comprising several components. These components often possess different volatilities which can lead to emission problems. In devices having a membrane in constant contact with the volatile liquid, an accumulation of volatile liquid components with the lowest comparative volatilities can occur leading to an undesirable non-uniform emanation profile for the liquid.

In either or both cases of build-up phenomena and accumulation of low volatility components, the evaporation rate, and thus the emanation rate, of the volatile liquid adopts the profile shown in Fig. 4.

Eventually the emanation rate may reach equilibrium (dashed line) where the rate of evaporation of each individual component of the volatile liquid away from the membrane surface is equivalent to the rate of deposition due to diffusion and the device cannot maintain any further vacuum.

A further drawback with known passive volatile liquid emanators is that prolonged exposure of the volatile liquid to a wicking material, such as a membrane or the like, can cause fractionation over time due to various factors such as the wicking material having a limited porosity affecting liquid transfer rates/evaporation rates which, in turn, can change the character and/or intensity of the volatile liquid being emanated. Changes in character of emanated volatile liquids is particularly noticeable for fragrances wherein common wicking materials cause the 'high notes' of a fragrance to be evaporated when the wicking material is first exposed to the fragranced liquid, and the 'low notes' are evaporated thereafter which affects the user's experience.

Accordingly, it is an object of the present invention to provide a device that is capable of addressing the abovementioned performance drawbacks and other drawbacks that will be appreciated by a person skilled in the art.

Summary of Invention

According to a first aspect of the present invention there is provided therefore a passive emanation device for emanating a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
and wherein the passive emanation device comprises:
a housing;
a volatile liquid reservoir;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s); and
an emanation substrate;
wherein the housing is arranged to support the reservoir, capillary tube(s) and nozzle(s) in spatial arrangement over the emanation substrate.

In the context of the present invention "non-valved" should be understood as meaning that that component of the device has no mechanical features which enable it to regulate or adjust the flow of liquid therethrough.

In the context of the present invention "passive" should be understood as meaning that that the device is operable without a power source or some other means which drives the emanation of the volatile liquid; in other words the device of the present invention only requires gravity in order emanate volatile liquid.

According to a second aspect of the present invention there is provided therefore a passive emanation device comprising:
a housing;
a volatile liquid reservoir holding a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s); and
an emanation substrate;
wherein the housing is arranged to support the reservoir, capillary tube and nozzle in spatial arrangement over the emanation substrate.

According to a third aspect of the present invention there is provided therefore a delivery mechanism for a passive emanation device according to the first aspect of the present invention, wherein the delivery mechanism is connectable, preferably releaseably connectable, to a housing of the passive emanation device and wherein the delivery mechanism comprises:
a volatile liquid reservoir holding a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s).

According to a forth aspect of the present invention there is provided a method of providing a normal flow rate of volatile liquid between substantially 0.1 - 500μL/hr on to an emanation

substrate, wherein the method comprises the steps of placing a device according to the second aspect of the present invention in a location where emanation of the volatile liquid is desired and causing the normal flow of liquid from the device toward the emanation substrate.

The non-valved arrangement may provide a device that once the liquid is allowed to flow from the reservoir the liquid will flow substantially continuously from the reservoir into the capillary tube to the nozzle and on to the emanation substrate at a normal flow rate of between substantially 0.1 - 500μL/hr, and preferably between substantially 1 - 50μL/hr. This normal flow rate has, surprisingly, been found to represent the optimal rate to emanate the volatile liquid to ensure satisfactory emanation thereof whilst minimising the onset of habituation to the volatile liquid. The mass of each droplet is preferably between substantially 0.1 - 500mg, and more preferably between substantially 0.5 - 70mg.

The inter-relationship of the various components of the device/delivery mechanism is critical in ensuring that the desired normal flow rate and droplet size is achieved.

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The reservoir is preferably substantially completely enclosed to prevent the evaporation of volatile liquid therefrom. The reservoir is preferably provided with a vent hole that can be opened to permit the flow of volatile liquid from the reservoir without the build up of negative pressure or a vacuum in the headspace of the reservoir. The vent hole is preferably provided in a side wall or an upper cover of the reservoir above the max height of the volatile liquid retained therein to permit air to vent into the headspace of the reservoir above the volatile liquid. The vent hole is preferably provided with an area of between substantially $7.9x10^{-3}$ – $1.9x10^{3}mm^{2}$, and even more preferably with an area of between substantially 0.8 – 3.1mm^{2}. The vent hole is preferably substantially cylindrical and provided with a diameter of between substantially 0.01 – 50mm, and even more preferably with a diameter of between substantially 1 – 2mm.

The vent hole may be covered by a removable seal member such that, once opened it shall remain open. Alternatively, the vent hole may be covered by a re-sealable sealing member which can be opened and re-sealed as desired by the user to, in effect, turn the emanation of volatile liquid from the device between a binary on and off position but without providing a user with the ability to select a position therebetween which could alter the normal flow rate.

The reservoir may be sized to retain a volume of volatile liquid between substantially 0.1 – 500ml, and preferably between substantially 10 – 40ml.

The reservoir may be shaped such that the volatile liquid head height therewithin is between substantially 0.1 – 100cm, and preferably between substantially 3 – 10cm; the liquid head height is defined within the context of the present invention as being the height of the liquid from the nozzle to the liquid-air surface in the reservoir.

The device/delivery mechanism may be provided with a mechanical boost means which is operable to increase the flow rate of the volatile liquid from the normal flow rate to an enhanced flow rate.

Preferably the mechanical boost means is in the form of an air pump connected to the reservoir which allows a user to pump air into the headspace of the reservoir to increase the air pressure thereof to at least temporarily increase the flow rate from the normal flow rate to the enhanced flow rate, once the user ceases further pumping the normal flow rate will resume once the air pressure in the head space equalises over a period of time.

Alternatively an auxiliary flow route for the volatile liquid may be provided, said auxiliary flow route being operable to being opened by a user to increase the flow rate to the enhanced flow rate before being closed and the flow rate being returned to the normal flow rate. The auxiliary flow route may be provided in the form of an aperture in the reservoir, possibly connected to a conduit, wherein the flow of volatile liquid therethrough is controlled by a valve that can be manipulated by a user. The auxiliary flow route would preferably be provided with a liquid exit orifice located substantially above the emanation substrate.

The auxiliary flow route may be connected to a auxiliary reservoir of volatile liquid which is adjacent to but not in liquid communication with the reservoir.

The enhanced flow rate may be between substantially 2 – 50 times greater than the normal flow rate, and preferably between substantially 2 – 5 times greater than the normal flow rate.

The reservoir may be provided in any shape, however, a substantially cylindrical shape is preferred. For substantially cylindrically shaped reservoirs they may be provided with a diameter of between substantially 1 – 50cm, but preferably with a diameter of between substantially 4 – 8cm, and may be provided with a depth of between substantially 0.1 – 100cm, but preferably with a depth of between substantially 0.5 – 2cm.

Preferably at least a portion of the reservoir is transparent to permit a user to see the level of volatile liquid held within, preferably substantially all of the reservoir is transparent.

Preferably the devices/delivery mechanisms according to the present invention are provided with a single capillary connected to the reservoir.

The or each capillary tube is preferably made of glass or plastic and may be substantially cylindrical although it could be provided in numerous other geometric shapes. The capillary tube(s) is preferably of a uniform shape and cross-section throughout its length. The capillary tube(s) may be provided with a length of between substantially 0.1 – 50cm, and preferably with a length of between substantially 3 – 10cm. In the most preferred embodiment the capillary tube(s) is/are substantially cylindrical and provided with an internal diameter of between substantially 1 - 1000μm, and preferably with an internal diameter of between substantially 75 - 100μm.

The capillary tube(s) may be provided with a filter to ensure that any contaminants in the volatile liquid do not inadvertently cause a blockage to liquid entering and moving along the capillary during use, thus, potentially affecting the flow rate.

The nozzle(s) is/are preferably provided with a substantially circular exit orifice having a diameter of between substantially 0.01 – 100mm, but preferably has a diameter of between substantially 0.4 – 2mm. The nozzle(s) may be provided with a cap to ensure that no volatile liquid is lost therefrom prior to use by a user.

The volatile liquid for use with the device/delivery mechanism of the present invention preferably possesses the at least one of, or more preferably two of, or most preferably al three of the following properties:
- viscosity between substantially 0.1 – 100cP, and preferably between substantially 1 – 5cP;
- density between substantially 0.1 – 10g/L, and preferably between substantially 0.8 – 1.1g/L;
- average surface tension between substantially 1 – 100mN/m, and preferably between substantially 1 – 50mN/m.

The emanation substrate may be made of any suitable material that may capture the volatile liquid droplet, preferably the emanation substrate is made from a material that is capable of at least partially absorbing the volatile liquid.

The housing is preferably provided in the form of an open framework which is configured to suspend the reservoir such that the capillary and nozzle are held directly above a substantially central point of the emanation substrate. Whilst an open framework is preferred since a user will be able to monitor the progress of volatile liquid from the reservoir through the capillary tube and

out of the nozzle on to the emanation substrate, the framework may be totally or partially enclosed to improve the safe operation of the device by preventing a user from being able to interrupt the flow from the liquid from the nozzle to the emanation substrate.

The preferred volatile liquid used with the device/delivery mechanism/method of the present invention is fragranced liquid for use as an air freshener. The present invention has been found to be particularly advantageous compared with known emanation methods due to the nature of fragranced volatile liquids.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example only, with reference to the following drawings in which:

Fig. 1 illustrates a side sectioned view of an emanation device;

Fig. 2 illustrates a perspective view of the emanation device; and

Fig. 3 illustrates a perspective view of a delivery mechanism for a passive emanation device.

Description of an Embodiment

Figs. 1 & 2 illustrate an passive emanation device 1 which is generally arranged to have a housing 2 provided in the form of framework 3 supporting a reservoir 4 which contains a quantity of volatile liquid 5. The reservoir 4 is supported over an emanation substrate 6. The reservoir is provided with a capillary tube 7 which extends from a substantially central portion of the reservoir 4 toward the emanation substrate 6. At the remote end of the capillary tube 7 is located a nozzle 8 from which, in use, volatile liquid will drop towards the emanation substrate 6.

Specifically the device 1 is a passive emanator as it is not powered by any form of propulsion or motor or electricity etc, rather it simply relies on the force of gravity to be operable and provide a normal flow rate. The device 1 is, importantly, non-valved in that there are no mechanical features of the delivery mechanism which can be altered to reduce the normal flow rate of liquid from the reservoir 4 to the emanation substrate 6 once the liquid has been allowed to flow, thus ensuring that the device is operating at an optimum flow rate or not operating at all. The optimum flow rate (the normal flow rate) for this device is 0.1 - 500μL/hr, but preferably the rate is between substantially 1 - 50μL/hr. This optimum flow rate is, ideally, achieved whilst maintaining the mass of each droplet at between substantially 0.1 - 500mg, and but preferably between substantially 0.5 - 70mg. Clearly the inter-relationship of the various components of the device 1 is critical in ensuring that this optimum flow rate and droplet mass is achieved.

As shown in Figs. 1 & 2 the reservoir 4 is substantially completely enclosed which acts to prevent evaporation of volatile liquid 5 therefrom. The reservoir 4 has a vent hole 9 that can be opened to permit the flow of volatile liquid 5 from the reservoir 4 without the build up of negative pressure or a vacuum in the headspace of the reservoir. The vent hole 9 is provided in the upper cover of the reservoir. The vent hole 9 is covered by a re-sealable sealing member 10 which operates via a screw thread mechanism to allow it to be brought into and out of sealing engagement with a upper surface of the vent hole 9.

The reservoir 4 may be sized to retain a volume of volatile liquid between substantially 0.1 – 500ml, but in Figs. 1 & 2 it is sized to retain between substantially 10 – 40ml. The volatile liquid head height therewithin may be between substantially 0.1 – 100cm, but is shown as being between substantially 5 – 12cm.

The reservoir 4 may be provided in any shape, however, Figs. 1&2 show the reservoir 4 to be substantially cylindrical with a diameter of between substantially 4 – 8cm and a depth of between substantially 0.5 – 2cm.

The framework 3 is of an open configuration so that it does not obscure the reservoir 4 which is transparent, thus permitting a user to see the level of volatile liquid held within. The capillary tube 7 is also transparent which allows the user to monitor the progress of liquid therethrough on its journey toward the emanation substrate 6.

The capillary tube 7 is shown as being made of glass and having a substantially uniform cylindrical shape having an internal diameter of between substantially 75 - 100μm and a length between substantially 3 – 10cm. The capillary tube 7 ends at its lowermost portion with the nozzle 8 which is shown as having an exit orifice between substantially 0.4 – 2mm. The nozzle is shown as being surrounded by a capillary housing 11 which provides additional safety for the operation of the device but ensuring that the potentially delicate capillary tube 7 and nozzle 8 can not be accidentally interfered with by a user during normal operation. Furthermore, the capillary housing 11 offers the nozzle 8 a degree of shielding from air currents surrounding which may affect the flow rate of volatile liquid droplets leaving the nozzle. Although not shown, the capillary housing 11 and/or the nozzle 8 may be provided with a cap to ensure that no volatile liquid is lost therefrom prior to use by a user.

The emanation substrate 6 could be made from any natural or synthetic material that is at least partially absorbent but is shown here as being made from a natural material which is at least partially absorbent so that it can emanate the volatile liquid over a prolonged period and, also,

ensure that the liquid dropped thereon does not remain in drop form resistant to evaporation due to the surface tension thereof.

Fig. 3 shows a delivery mechanism 12 which consists of a reservoir 4 which holds a quantity of volatile liquid 5 covered by a cap of the like (not shown), the reservoir 4 having a capillary tube 7 terminating in a nozzle 8. The delivery mechanism 12 could be used as a refill wherein it is replaceable within the housing 2 once the reservoir 4 held therewithin has been exhausted.

Examples are now described which illustrate the interoperation of the various parameters required to produce a device having the optimum flow rates called for in the devices of the present invention.

Example 1

Parameter	Value
Capillary Length	46 mm
Inner Capillary Diameter	100 μm
Nozzle Diameter	1.4 mm
Drop weight	11.5 mg
Reservoir Volume (fragrance)	30 mL
Liquid Head Height (from nozzle tip to top of liquid)	56.6 mm
Reservoir Diameter*	6 cm
Reservoir Depth (fragrance)*	1.06 cm
Vent Hole Diameter	1 mm
Fragrance Viscosity	3.2 cP
Fragrance Density	0.89 g/L
Fragrance Surface Tension	26.8 mN/m
Flow Rate	29.7 uL/hr

Example 2

Parameter	Value
Capillary Length	100 mm
Inner Capillary Diameter	100 μm
Nozzle Diameter	5.9 mm
Drop weight	29 mg
Reservoir Volume (fragrance)	30 mL
Liquid Head Height (from nozzle tip to top of liquid)	110.6 mm
Reservoir Diameter*	6 cm
Reservoir Depth (fragrance)*	1.06 cm

Vent Hole Diameter	1 mm
Fragrance Viscosity	3.2 cP
Fragrance Density	0.89 g/L
Fragrance Surface Tension	26.8 mN/m
Flow Rate	26.7 uL/hr

Both devices from examples 1 & 2 were operated for a continuous period until the fragranced volatile liquid was exhausted and both devices consistently produced the flow rates and drop weights described above.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

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Claims

1. A passive emanation device for emanating a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
and wherein the passive emanation device comprises:
a housing;
a volatile liquid reservoir;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s); and
an emanation substrate;
wherein the housing is arranged to support the reservoir, capillary tube(s) and nozzle(s) in spatial arrangement over the emanation substrate.

2. A device according to claim 1, wherein the device is configured to allow liquid on to the emanation substrate at a normal flow rate of between substantially 0.1 - 500μL/hr, and preferably between substantially 1 - 50μL/hr.

3. A device according to claim 1 or claim 2, wherein the device is configured to allow the mass of each liquid droplet to be between substantially 0.1 - 500mg, and preferably between substantially 0.5 - 70mg.

4. A device according to any preceding claim, wherein the reservoir is provided with a vent hole.

5. A device according to claim 4, wherein the vent hole is covered by a re-sealable sealing member which can be opened and re-sealed.

6. A device according to any preceding claim, wherein the reservoir is sized to retain a volume of volatile liquid between substantially 0.1 – 500ml, and preferably between substantially 10 – 40ml.

7. A device according to any preceding claim, wherein the reservoir is shaped such that the volatile liquid head height therewithin is between substantially 0.1 – 100cm, and preferably between substantially 3 – 10cm.

8. A device according to any preceding claim, wherein the reservoir is substantially cylindrically shaped and have a diameter of between substantially 1 – 50cm, but preferably between substantially 4 – 8cm, and have a depth of between substantially 0.1 – 100cm, but preferably between substantially 0.5 – 2cm.

9. A device according to any preceding claim, wherein a single capillary tube is provided.

10. A device according to any preceding claim, wherein the capillary tube(s) is/are provided with a length of between substantially 0.1 – 50cm, and preferably with a length of between substantially 3 – 10cm.

11. A device according to any preceding claim, wherein the capillary tube(s) is/are substantially cylindrical and provided with an internal diameter of between substantially 1 - 1000μm, and preferably with an internal diameter of between substantially 75 - 100μm.

12. A device according to any preceding claim, wherein the nozzle(s) is/are provided with a substantially circular exit orifice having a diameter of between substantially 0.01 – 100mm, but preferably has a diameter of between substantially 0.4 – 2mm.

13. A device according to any preceding claim, wherein the emanation substrate is made from a material that is capable of at least partially absorbing the volatile liquid.

14. A device according to any preceding claim, wherein the housing is provided in the form of an open framework which is configured to suspend the reservoir such that the capillary and nozzle are held directly above a substantially central point of the emanation substrate.

15. A delivery mechanism for a passive emanation device according to any preceding claim, wherein the delivery mechanism is connectable, preferably releaseably connectable, to a housing of the passive emanation device and wherein the delivery mechanism comprises:
a volatile liquid reservoir holding a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s).

16. A passive emanation device comprising:
a housing;
a volatile liquid reservoir holding a volatile liquid containing one or more active materials wherein the active material comprises at least one of: a fragrance; an insecticide; a fungicide; a pesticide; a sanitising material; and/or a pharmaceutical;
one or more capillary tubes in fluid communication with the reservoir at one end thereof wherein said one or more capillary tubes are in non-valved fluid communication with the reservoir;
a nozzle located at the end of the or each capillary tube(s) remote from the reservoir wherein the or each nozzle is in non-valved fluid communication with the or each capillary tube(s); and
an emanation substrate;
wherein the housing is arranged to support the reservoir, capillary tube and nozzle in spatial arrangement over the emanation substrate.

17. A mechanism or device according to either claim 15 or claim 16 respectively, wherein the volatile liquid possesses the at least one of, or more preferably two of, or most preferably all three of the following properties:
- viscosity between substantially 0.1 – 100cP, and preferably between substantially 1 – 5cP;
- density between substantially 0.1 – 10g/L, and preferably between substantially 0.8 – 1.1g/L;
- average surface tension between substantially 1 – 100mN/m, and preferably between substantially 1 – 50mN/m.

18. A method of providing a flow rate of volatile liquid between substantially 0.1 - 500μL/hr on to an emanation substrate, wherein the method comprises the steps of placing a device according to claim 16 in a location where emanation of the volatile liquid is desired and causing the flow of liquid from the device toward the emanation substrate.

19. A passive emanation device substantially as described herein and with reference to the drawings.

Application No:	GB1010594.8	**Examiner:**	Mr Alun Owen
Claims searched:	1-19	**Date of search:**	21 October 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-18	US 2004/0261790 A1 (JOSHI ET AL.) See especially Figure 4 and paragraphs [0033]-[0034]
X	15	FR 2797189 A1 (LENFANT) See especially the Figures and WPI Abstract Accession Number 2001-149850 [16]
X	15	US 2009/0159719 A1 (MILLET) See especially the Figures and paragraphs [0050]-[0052]
X	15	US 2007/0247555 A1 (DIERSING ET AL.) See especially paragraphs [0020]-[0032]
X	15	FR 2937884 A1 (OSMOOZE) See especially Figure 1 and WPI Abstract Accession Number 2010-E87722 [32]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A01M; A61L; A61M

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A61L	0009/12	01/01/2006
A01M	0001/20	01/01/2006
A61M	0011/00	01/01/2006